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Immobilization of Carboxylic Acid Groups on Polymeric Substrates by Plasma-enhanced Chemical Vapor or Atmospheric Pressure Plasma Deposition of Acetic Acid

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Abstract

Low-pressure plasma-enhanced chemical vapor deposition (PECVD) is a process that activates the precursor in the plasma state to deposit films on the surface. Introducing carboxylic acid functional groups via PECVD has been widely applied in various applications, such as the enhancement of interfacial adhesion between fillers and matrices in composite materials, molecular grafting for biosensors and biocompatibility improvement. To develop a compatible surface for cell adhesion, polymeric substrates, poly (lactic acid) (PLA) and polyethylene terephthalate (PET), were modified by a low-pressure acetic acid plasma to improve surface hydrophilicity and biocompatibility. The acetic acid plasma deposited film maintained stability on a hydrophilic surface for long-term aging. If the acetic acid film can be deposited by process using atmospheric pressure plasma (APP), a more rapid, economic and power-saving method can be achieved. In this study, a remote APP system using a bespoke Pyrex APP chamber was utilized to deposit acetic acid film onto the surfaces of polymeric substrates. The wettability, stability of hydrophilicity and surface elemental composition of the APP-deposited film were reported and compared with that prepared via low-pressure acetic acid plasma. The plasma functionalized PET showed good stability and a long-term hydrophilicity. Although the plasma processes